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Improvements in Electrical Surge Diverters

This invention concerns improvements in electrical surge diverters (also known as surge arresters) as used particularly, though not exclusively, in electrical power distribution and transmission systems for the safe handling of atmospherically induced surges (lightning strikes for instance) and overvoltages caused by switching operations.

As is well known in the surge diverter art and as is described in our British Patent Application No. 7918273 (Serial No. 2050719), surge arresters commonly comprise a non-linear resistor arrangement contained within the bore of a glazed porcelain insulator housing. The non-linear resistor arrangement commonly has comprised a series arrangement of spark gaps and silicon carbide varistor

elements and is designed such that, in the event of a voltage surge on a line connected to the arrester, the spark gaps flash over and put an earth fault on the line for the duration of the surge, the power follow current which can flow through the arrester being limited by the series non-linear resistors to a level which can be cleared by the spark gaps.

The porcelain housing places various constraints upon the manufacture of surge arresters. It is conventional to vacuum dry the assembly of the non-linear resistor arrangement with the porcelain housing and to fill the arrester with an inert gas prior to final sealing. It is also conventional, particularly in the case of larger sized, station class diverters but also in the case of smaller distribution type diverters, to provide a pressure-relief diaphragm at one or both ends of the porcelain insulator housing adapted to rupture in the event of an overpressure occurring in the gas filling of the diverter as a result of the expansion of this gas when the diverter operates to divert a current surge to earth. The purpose of these provisions has been to protect the porcelain housing against explosive shattering which otherwise can occur with corresponding risk to life and property.

The cost of the porcelain insulator housing and of the treatments and arrangements necessary to minimise the danger it presents by virtue of its risk of explosive shattering, has conventionally contributed very significantly to the cost of a surge diverter.

The present invention proposes to obviate the use of porcelain insulators as housings, for surge arresters. According to the invention, a surge diverter/arrester comprises an electrical surge diverter/arrester comprising a tubular hosuing, end caps located one at each end of said housing, a non-linear resistor assembly located within said housing and between said end caps, said housing consisting of a heat-shrink material in

engagement with said end caps and serving to compress said end caps onto said resistor assembly.

Such a surge arrester, by virtue of the nature of heat-shrink materials which are in themselves well known, is not subject to any explosive

shattering problems and so has no need for special rupturable end seals and, in its manufacture, has no need for the evacuation, drying and inert gas filling stages of conventional surge arresters housed in porcelain. Other advantages arise by virtue of the considerable weight saving which arises by use of heat-shrink material in place of porcelain, which reflects in lower mounting bracket costs, lower installation costs, and lower transportation costs.

The heat-shrink material is necessarily a high voltage electrical insulator, capable of withstanding the electrical potential of a lightning strike for example without dielectric breakdown. Such materials are known per se. One such heat-shrink material is a modified ethylene propylene polymer preferably incorporating an anti-creepage tracking agent.

An exemplary embodiment of the invention is illustrated in the accompanying drawing and will be described hereinafter in order that the invention might be clearly understood.

In the drawing, details of the non-linear resistor assembly 1 are not shown. This assembly ~~ean~~ be of any ~~a~~ppropriate form such as the conventional series arrangement of silicon carbide resistors for example or an alternative arrangement comprising zinc oxide varistors. End caps 2 formed with terminal posts 3 are provided at each end of the non-linear resistor assembly 1, and the whole is secured together by means of a sleeve 4 of heat-shrink material. The end caps 2 are formed as shown so as to constitute with the heat-shrink sleeve 4 effective end seals for the non-linear resistor assembly 1 and also so that as the sleeve 4 is shrunk down onto the combination of assembly 1 and end caps 2, the sleeve 4 compacts the end caps 2 onto the assembly 1 and ensures good electrical

connection between the end caps 2 and the assembly 1. Circumferential grooves formed in the end caps 2 ensure that the heat shrink material binds firmly with the end caps 2.

A plurality of sheds 5 is provided. These preferably are formed also of heat-shrink material and can be formed integrally with the sleeve 4 or can be separate therefrom.

One or more electrically insulating reinforcing rods 6 may be passed through bores in the resistor arrangement 1 to augment the rigidity of the finished arrester.

The above-described embodiment of the invention is but one example of a surge arrester constructed in accordance with the invention and, as will be appreciated by those possessed of appropriate skills and knowledge, various modifications and alternatives are possible. For example, a three phase type surge arrester could be constructed in accordance with the invention so as to have three non-linear resistor limbs extending from a common base mounting, each limb constituting an arrester for one particular phase, and with the three limbs housed within a three-part heat-shrink "udder".

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CLAIMS:

1. An electrical surge diverter/arrester comprising a tubular housing, end caps located one at each end of said housing, a non-linear resistor assembly located within said housing and between said end caps, said housing consisting of a heat-shrink material in engagement with said end caps and serving to compress said end caps onto said resistor assembly.

2. An electrical surge diverter/arrester according to claim 1, wherein said heat-shrink material incorporates an agent for inhibiting electrical creepage tracking.

3. An electrical surge diverter/arrester as claimed in claim 1 or 2, wherein said heat-shrink material comprises a modified ethylene propylene polymer.

4. An electrical surge diverter/arrester as claimed in any of the preceding claims, wherein the non-linear resistor assembly comprises zinc oxide varistors.

5. An electrical surge diverter/arrester as claimed in any of the preceding claims, incorporating one or more electrically insulating reinforcing elements extending through the non-linear resistor assembly longitudinally of the tubular housing.

6. An electrical surge diverter/arrester as claimed in claims 4 and 5, wherein said zinc oxide varistors each include a central aperture and a single reinforcing element in the form of a rod extends through the aperture of each varistor.

7. An electrical surge diverter/arrester as claimed in any of the preceding claims, wherein when said housing is heat-shrunk the lateral contraction thereof engages the

end caps with the housing and the longitudinal contraction thereof compacts the end caps on to the non-linear resistor assembly.

8. An electrical surge diverter/arrester as claimed in any of the preceding claims, including a plurality of sheds externally of said housing, said sheds being formed of heat-shrink material.

9. An electrical surge diverter/arrester as claimed in claim 8, wherein the sheds are formed integrally with the housing.

10. An electrical surge diverter/arrester as claimed in any of the preceding claims, constructed for multi-phase application and comprising a non-linear resistor assembly for each phase extending from a common base mounting, each assembly constituting a diverter/arrester for one particular phase, and wherein the multiple assemblies are housed each within one part of a multiple part heat shrink "udder".

11. An electrical surge diverter/arrester substantially as herein described with reference to the accompanying drawing.

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